CLAIMS

We claim:

1. A population of conjugate molecules, said conjugate molecules comprising an antigen and a polynucleotide comprising an immunostimulatory sequence (ISS), wherein the extent of conjugation in the population is such that the ratio of (i) concentration of ISS-antigen conjugate required for 50% inhibition of binding of antigen-specific antibody to antigen to (ii) concentration of antigen required for 50% inhibition of antigen-specific antibody to antigen is about 3.5 to about 6.0.

2. A population of conjugate molecules, said conjugate molecules comprising an antigen and a polynucleotide comprising an immunostimulatory sequence (ISS), wherein the antigen is an allergen, and wherein the extent of conjugation in the population is such that the ratio of (i) concentration of ISS-antigen conjugate required for about 40% histamine release from basophils from an antigen-sensitized individual to (ii) concentration of antigen required for about 40% histamine release from basophils from an antigen-sensitized individual is greater than about 1000.

3. The population of claim 2, wherein the allergen is Amb a 1.

4. A population of conjugate molecules, said conjugate molecules comprising an antigen and a polynucleotides comprising an immunostimulatory sequence (ISS), wherein the extent of conjugation in the population is such that the ratio of (i) concentration of ISS-antigen conjugate required for 50% inhibition of binding of antigen-specific antibody to antigen to (ii) concentration of antigen required for 50% inhibition of antigen-specific antibody to antigen is about 2.5 to about 3.0.

5. A population of conjugate molecules, said conjugate molecules comprising an antigen and a polynucleotides comprising an immunostimulatory sequence (ISS), wherein the antigen is an allergen, and wherein the extent of conjugation in the population is such that the ratio of (i) concentration of ISS-antigen conjugate required for about 40% histamine release from basophils from an antigen-sensitized individual to (ii) concentration of antigen required for about 40% histamine release from basophils from an antigen-sensitized individual is about 100 to about 200.

6. The population of claim 5, wherein the allergen is Amb a 1.

7. A composition comprising the population of claim 1 in a pharmaceutically acceptable excipient.

8. A composition comprising the population of claim 2 in a pharmaceutically acceptable excipient.

9. A composition comprising the population of claim 4 in a pharmaceutically acceptable excipient.

10. A composition comprising the population of claim 5 in a pharmaceutically acceptable excipient.

11. A method of modulating an immune response in an individual, comprising administering to the individual the composition of claim 7 in an amount sufficient to modulate the immune response.

12. A method according to claim 11, wherein the modulation comprises stimulating production of a Th1-associated cytokine.

13. A method according to claim 11 wherein the modulation comprises reducing production of a Th2-associated cytokine.

14. A method according to claim 11, wherein the modulation comprises suppressing production of antigen-specific antibodies.

15. A method of modulating an immune response in an individual, comprising administering to the individual the composition of claim 8 in an amount sufficient to modulate the immune response.

16. A method according to claim 15, wherein the modulation comprises stimulating production of a Th1-associated cytokine.

17. A method according to claim 15, wherein the modulation comprises reducing production of a Th2-associated cytokine.

18. A method according to claim 15, wherein the modulation comprises suppressing production of antigen-specific antibodies.

19. A method of modulating an immune response in an individual, comprising administering to the individual the composition of claim 9 in an amount sufficient to modulate the immune response.

20. A method according to claim 19, wherein the modulation comprises stimulating production of a Th1-associated cytokine.

21. A method according to claim 19 wherein the modulation comprises reducing production of a Th2-associated cytokine.

22. A method of modulating an immune response in an individual, comprising administering to the individual the composition of claim 10 in an amount sufficient to modulate the immune response.

23. A method according to claim 22, wherein the modulation comprises stimulating production of a Th1-associated cytokine.

24. A method according to claim 22, wherein the modulation comprises reducing production of a Th2-associated cytokine.

25. A method of treating an allergic condition in an individual, comprising administering a composition comprising the population of claim 2 and a pharmaceutically acceptable excipient, said composition administered in an amount sufficient to palliate the allergic condition.

26. A method according to claim 25, wherein production of a Th1-associated cytokine is stimulated.

27. A method for reducing antigen-stimulated IgE production in an individual, comprising administering the composition of claim 8 in an amount sufficient to reduce IgE production stimulated by the antigen in the individual.

28. A method for reducing antigen-stimulated IgE production in an individual, comprising administering the composition of claim 10 in an amount sufficient to reduce IgE production stimulated by the antigen in the individual.

29. A method for treating an IgE-related disorder in an individual, comprising administering the composition of claim 8 in an amount sufficient to reduce IgE production and treat the disorder in the individual.

30. A method for treating an IgE-related disorder in an individual, comprising administering the composition of claim 10 in an amount sufficient to reduce IgE production and treat the disorder in the individual.

31. A method for stimulating Th1 lymphocytes in an individual, comprising administering the composition of claim 7 in an amount sufficient to stimulate Th1 lymphocytes in the individual.

32. A method according to claim 31, wherein production of a Th1-associated cytokine is stimulated.

33. A method for stimulating Th1 lymphocytes in an individual, comprising administering the composition of claim 8 in an amount sufficient to stimulate Th1 lymphocytes in the individual.

34. A method for stimulating Th1 lymphocytes in an individual, comprising administering the composition of claim 9 in an amount sufficient to stimulate Th1 lymphocytes in the individual.

35. A method according to claim 34, wherein production of a Th1-associated cytokine is stimulated.

36. A method for stimulating Th1 lymphocytes in an individual, comprising administering the composition of claim 10 in an amount sufficient to stimulate Th1 lymphocytes in the individual.

37. A method for suppressing Th2 lymphocytes in an individual, comprising administering the composition of claim 7 in an amount sufficient to suppress Th2 lymphocytes in the individual.

38. A method according to claim 37, wherein production of a Th2-associated cytokine is suppressed.

39. A method for suppressing Th2 lymphocytes in an individual, comprising administering the composition of claim 8 in an amount sufficient to suppress Th2 lymphocytes in the individual.

40. A method for suppressing Th2 lymphocytes in an individual, comprising administering the composit of claim 9 in an amount sufficient to suppress Th2 lymphocytes in the individual.

41. A method according to claim 40, wherein production of a Th2-associated cytokine is suppressed.

42. A method for suppressing Th2 lymphocytes in an individual, comprising administering the composition of claim 10 in an amount sufficient to suppress Th2 lymphocytes in the individual.